構造計画研究所
KOZO KEIKAKU ENGINEERING Inc.

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Case Study of Powder and Multiphase Flow Simulation Software, iGRAF

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AJINOMOTO CO.,INC.

"The capability of iGRAF to perform simulation for the "complicated powder behavior" has reduced the waste of raw materials and speed up the product development."

Ajinomoto Co., Inc. Food Products Division Institute of Food Sciences and Technologies Product Development Center Engineering Group
(From right) Associate General Manager Takeshi Nishinomiya, Kazuaki Shibuki, Sumi Yamazaki

Ajinomoto Co., Inc. produces a wide variety of seasonings, beverages, processed foods etc.
The engineering group is in charge of the development of engineering related technologies, from the development process to the factory design. In September 2017, the Group has introduced iGRAF, a powder and multiphase flow simulation software developed by Kozo Keikaku Engineering Inc.
We interviewed Associate General Manager Takeshi Nishinomiya, Kazuaki Shibuki and Sumi Yamazaki regarding the aim and results using iGRAF.

Is there a more effective way instead of conducting experiments using an actual machine?

— What are the reasons of using Kozo Keikaku Engineering's powder and multiphase flow simulation software?

Most of our products consist of "powders", such as seasonings, soups etc.

We are working on particles design to enhance the function of the powder and the technology to control the physical properties of the powder for a better product, but in fact the behavior of powder is quite tricky.

For example, if liquids are mixed, basically they are maintained at a homogeneous mixture state. Whereas for powders, it is possible for segregation to occur. As a result, the powders may not be mixed evenly and the product might need to be discarded.

Experiments are carried out in a small scale to find the solution for this issue, but it may not work well when it is scaled up for an actual machine. As a result, the experiments have to be conducted all over again, resulting in a waste of time and raw materials for the trial and error process.

Kazuaki Shibuki

At the time when I was looking for a more effective way to solve this issue, I have learned about powder simulation technology at an academic conference.

With the guidance of Dr. Mikio Sakai (Associate Professor at System Resilience Engineering Research Center, The University of Tokyo), we considered the applicability of the simulation software to our assignment for a year. As a result, the powder simulation software iGRAF was introduced.

Simulation software from other companies were also considered but iGRAF impressed us with its simple and intuitive operational method.

— Can you please tell us why you chose iGRAF specifically?

Other companies provided trial version and also trainings but it seemed difficult to set the simulation parameters or run the software without relying on them.

On the other hand, iGRAF can be easily used by learning the software tutorials.

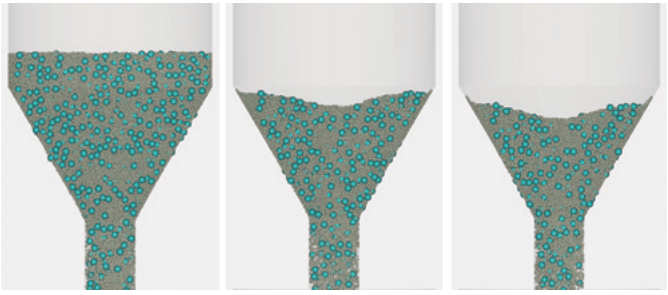
This is why iGRAF is chosen.

Huge benefits are expected even if the process is practically reproduced

— What kind of simulations were conducted after introducing iGRAF?

The common processes of various powders are mixing, discharging and filling.

We have started with the analysis of storing and discharging process of a hopper.



a b c

Powder discharge flow in a hopper
【discharge rate 10 vol%(a) 50 vol%(b) 70 vol%(c)】

— How would you evaluate the software?

The powders that we are using are smaller than 1mm.

With the simulation, we do not expect that the phenomenon to be reproduced perfectly as extremely difficult calculations are needed in order to use the original particle size.

For example, cases A, B and C with different conditions are simulated to find the worst condition. If the process can be practically reproduced to find the worst condition, two-thirds of the cost of stopping the production line for testing purpose can be reduced. This is the most significant benefit of this software.

Also, if devices with different shapes are to be tested, it takes several months to produce the devices. Even the test devices are ready, experiments and analysis require time, too. With iGRAF, however, the results can be obtained within a week. Time reduction is also one of the notable benefits of this software.

Choosing a user-friendly software was important for us because it would be better if the software can be widely used within the company.

Sumi Yamazaki

We are at the first stage of using the software, and we aim to solve all the problems arise from the manufacturing site.

Therefore, we have started to share the experience of using iGRAF with the colleagues in Institute of Food Sciences and Technologies.

After showing the simulation animation to my colleagues, we received many feedbacks saying, “The powder behavior is similar to the actual one” . Moreover, other researchers who have only experienced experiments were showing interest on the software and commented “Maybe this can be applied to that”, “Can you simulate something like this”, etc.

Accumulate the know-how of the simulation and make use of it in equipment design

— After listening to what you have said, I feel that this software will be applied widely in the future.

I agree. It is known to be difficult to calculate with the actual size of the particle, but we would like to accumulate the know-how of the simulation in order to overcome it.

One of the ways to utilize the software is to solve the problems arise from the manufacturing site.

Besides, we can accumulate the basic knowledge of the optimal operation conditions of the equipment that we are using.

Although repeating the tests by using equipment is common in the industry, wouldn’t it be better to do it at a lower cost?

In other words, the decisions based on experiment experiences can be replaced by the physical theories.

Takeshi Nishinomiya

Eventually, we would like to take the result of the simulations as a reference to design the equipment. We are aiming for an environment where simulation is commonly used for engineering, such as having a discussion like “We should design a stirring device for the mixing of small and large particles” or similar topics.

First, there will be an improvement on the existing equipment and we would like to put into action using the simulation result as soon as possible.

— Lastly, please tell us about your future expectations from Kozo Keikaku Engineering.

We really appreciate the support that you have given to us whenever we face troubles. As iGRAF is released for only a few years, we think that the functions will be upgraded steadily from now on and we are looking forward to it.

We appreciate your continued support.

Interviewed in November 2018

AJINOMOTO CO.,INC.	Founded in 1925 ■ Location: Kyobashi,Chuo-ku,Tokyo ■ www.ajinomoto.com/en/

Read the interview on the Internet ▶ www.kke.co.jp/en/solution/casestudy/igraf_ajinomoto.html

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